OIPE JC164
JUN 1 8 2003
PATENT & TRADEMARK OFFICE

AF/ ~~26~~ 2631
Haratsch 1-4

#16
1/2/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s):	Haratsch et al.
Case:	1-4
Serial No.:	09/326,785
Filing Date:	June 4, 1999
Group:	2631
Examiner:	Pankaj Kumar

I hereby certify that this paper is being deposited on this date with the U.S. Postal Service as first class mail addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Signature Tina Mauro Date: June 16, 2003

Title: Method and Apparatus for Reducing the Computational Complexity and Relaxing the Critical Path of Reduced State Sequence Estimation (RSSE) Techniques

---

TRANSMITTAL OF APPEAL BRIEF

RECEIVED
JUN 2 0 2003
Technology Center 2600

Mail Stop Appeal Brief
Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith are the following documents relating to the above-identified patent application:

1. Appeal Brief (original and two copies); and
2. Copy of Notice of Appeal, filed on April 10, 2003, with copy of stamped return postcard indicating receipt of Notice by PTO on April 15, 2003.

There is an additional fee of $320 due in conjunction with this submission under 37 CFR §1.17(c). Please charge **Deposit Account No. 50-0762** the amount of $320, to cover this fee. In the event of non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Deposit Account No. 50-0762** as required to correct the error. A duplicate copy of this letter and two copies of the Appeal Brief are enclosed.

Respectfully,

Kevin M. Mason

Date: June 16, 2003

Kevin M. Mason
Attorney for Applicant(s)
Reg. No. 36,597
Ryan, Mason & Lewis, LLP
1300 Post Road, Suite 205
Fairfield, CT 06824
(203) 255-6560

16

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s):	Haratsch et al.
Case:	1-4
Serial No.:	09/326,785
Filing Date:	June 4, 1999
Group:	2631
Examiner:	Pankaj Kumar
Title:	Method and Apparatus for Reducing the Computational Complexity and Relaxing the Critical Path of Reduced State Sequence Estimation (RSSE) Techniques

I hereby certify that this paper is being deposited on this date with the U.S. Postal Service as first class mail addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Signature: Dina Maurie Date: June 16, 2003

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby appeal the final rejection dated January 10, 2003, of claims 1 through 22 of the above-identified patent application.

REAL PARTY IN INTEREST

The present application is assigned to Agere Systems Inc., as evidenced by the statement under 37 CFR 3.73 (b) submitted on June 4, 1998. The assignee, Agere Systems Inc., is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related Appeals or Interferences.

STATUS OF CLAIMS

Claims 1 through 22 are pending in the above-identified patent application. Claims 1 through 22 remain rejected under 35 U.S.C. § 102(b) as being anticipated by Amrany (United States Patent Number 5,319,585).

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the final rejection.

SUMMARY OF INVENTION

The present invention is directed to a method and apparatus for reducing the complexity of reduced state sequence estimation (RSSE) techniques for a given number of states while also reducing the critical path problem. The intersymbol interference due to the less significant tail taps of the channel impulse response is processed with a lower complexity cancellation algorithm using tentative decisions, while the intersymbol interference due to the more significant initial taps is processed with a more complex cancellation algorithm, such as a reduced state sequence estimation technique or an M-algorithm technique.

ISSUES PRESENTED FOR REVIEW

i. Whether Claims 1-22 are properly rejected under 35 U.S.C. § 102(b) as being anticipated by Amrany.

GROUPING OF CLAIMS

The rejected claims do not stand and fall together. More particularly, for the reasons given below, Applicant believes that each of the dependent claims 2/11 and 8/15 provide independent bases for patentability apart from the rejected independent claims.

ARGUMENT

Claims 1 through 22 are rejected under 35 U.S.C. § 102(b) as being anticipated by Amrany.

The Examiner asserts that Amrany teaches a method (or a receiver) that processes ISI (citing Amrany col. 1, lines 43-51; par. 5, par. 7, and noting that an "equalizer compensates for ISI") due to less significant taps (citing Fig. 2, element 92) with a lower complexity algorithm (citing col. 6, last par.) using tentative decisions

(citing col. 6, eq. 12; Fig. 3, elements 548, 549, 546); and processing ISI due to more significant taps (Fig. 2, element 91) with a reduced state sequence estimation technique (Fig. 3, elements 545 and 546, "is a reduced state compared to 548 with 549 and 546 since it requires fewer elements").

Less (or More) Significant **Bits** are Not Less (or More) Significant **Taps**

The Examiner asserts that the ISI due to less significant taps, as recited in the claims of the present application, are anticipated by the less significant bits (LSBs) shown in Fig. 2, element 92, and corresponding text, and that the the ISI due to more significant taps are anticipated by the more significant bits (MSBs) shown in Fig. 2, element 91. It is noted that Amrany uses two filters in parallel (one for MSBs of each tap and one for LSBs of each tap), rather than using a single filter. As shown by equation 6 of Amrany, each 24 bit filter coefficient is rewritten as a sum of MSBs and LSBs. Thus, the MSBs of **all taps** in Amrany are applied to one filter, while the LSBs of **all taps** in Amrany are applied to another filter.

The present invention, on the other hand, as set forth in each independent claim, applies *all bits of the less significant taps to one processing unit* (employing a lower complexity algorithm), and *all bits of the more significant taps to another processing unit* (employing an RSSE algorithm). These processing units are not necessarily filters, e.g., the processing block employing the RSSE algorithm is not a filter, but a reduced-state sequence detector, a term well understood by those of ordinary skill in the art.

In the Advisory Action, the Examiner asserts that "fewer elements in a sequence estimation system constitutes a reduced state sequence estimator." Applicants note that the term "RSSE" is a well defined term of art and established by the references cited in the disclosure. In particular, the following references support the definition of RSSE argued by the Applicants: P. R. Chevillat and E. Eleftheriou, "Decoding of Trellis-Encoded Signals in the Presence of Intersymbol Interference and Noise", IEEE Trans. Commun., vol. 37, 669-76, (July 1989) and M. V. Eyuboglu and S. U. H. Qureshi, "Reduced-State Sequence Estimation For Coded Modulation On Intersymbol Interference Channels", IEEE JSAC, vol. 7, 989-95 (Aug. 1989).

Among other things, RSSE requires the processing of a received trellis-encoded or ISI-corrupted signal using a trellis, which is not mentioned, disclosed or suggested by Amrany. The fact that element 545/546 has "fewer elements" than 548/549/546 has no relevance to the well understood concept of RSSE.

Thus, Amrany does not disclose or suggest "processing intersymbol interference due to *less significant taps* with a lower complexity cancellation algorithm using *tentative decisions*; and processing intersymbol interference due to *more significant taps* with a *reduced state sequence estimation* technique," as required by independent claims 1, 10 and 22.

Similarly, Amrany does not disclose or suggest "processing intersymbol interference due to *less significant taps* with a first algorithm of first complexity; and processing intersymbol interference due to *more significant taps* with a second algorithm of second complexity that is greater than said first complexity," as required by independent claims 19-21.

Updating Filter Coefficients Does Not Suggest Tentative Decisions

The Examiner asserts that col. 6, equation 12, and elements 548, 549 and 546 of Amrany suggest canceling the ISI due to less significant taps using *tentative decisions*, as required by the claims of the present application. It is noted, however, that the passages referenced by the Examiner are merely directed to updating the coefficients of the echo canceller 548 in accordance with Equation 12, which is well known to those of ordinary skill in the art. As used in the present application, the term "tentative decision" means a decision for the transmitted data symbol that is possibly less reliable than the final decision of the overall detector and that is used by the lower complexity cancellation algorithm to *cancel ISI* due to less significant taps. See, e.g., page 3, line 29, to page 4, line 2, and page 5, line 19, to page 8 of the substitute specification.

Echo canceller 548 in Amrany is a filter that cancels echoes using the LSBs of all filter taps, and echo canceller 545 is an echo canceller that cancels echoes using the MSBs of all filter taps. In any case, these elements are performing echo cancellation and *not* equalization (processing of ISI), and they do not use tentative decisions, as defined in the present application and required by each of the independent

claims. Clearly, a patentee is entitled to be his own lexicographer. See, e.g., *Rohm & Haas Co. v. Dawson Chemical Co., Inc.*, 557 F. Supp 739, 217 U.S.P.Q. 515, 573 (Tex. 1983); *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 228 U.S.P.Q. 90 (Fed. Cir. 1985); and *Fonar Corp. v. Johnson & Johnson*, 821 F.2d 627, 3 U.S.P.Q.2d 1109 (Fed. Cir. 1987).

The interpretation of the term "tentative decision" asserted by the Examiner is inconsistent with the definition provided in the specification and is not how the term would be understood by a person of ordinary skill, based on the specification. When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term. *Multiform Desiccants Inc. v. Medzam Ltd.*, 133 F.3d 1473, 45 U.S.P.Q.2d 1429, 1433 (Fed. Cir. 1998).

Independent Claims 17 and 18

The Examiner did not specifically address Independent Claims 17 and 18 in the final Office Action. Independent Claims 17 and 18 require processing the more significant taps with an M-algorithm technique. Amrany does not disclose the M-algorithm at all, including use of the M-algorithm to cancel ISI due to more significant taps, while intersymbol interference due to less significant taps is cancelled with a lower complexity equalization algorithm, as required by independent claims 17 and 18.

Thus, Amrany does not disclose or suggest "processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and processing intersymbol interference due to more significant taps with an M-algorithm (MA) technique," as required by independent claims 17 and 18.

Conclusion

Thus, Amrany does not disclose or suggest "processing intersymbol interference due to *less significant taps* with a lower complexity cancellation algorithm using *tentative decisions*; and processing intersymbol interference due to *more significant taps* with a *reduced state sequence estimation* technique," as required by independent claims 1, 10 and 22, does not disclose or suggest "processing intersymbol interference due to *less significant taps* with a first algorithm of first complexity; and processing

intersymbol interference due to *more significant taps* with a second algorithm of second complexity that is greater than said first complexity," as required by independent claims 19-21 and does not disclose or suggest "processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and processing intersymbol interference due to more significant taps with an M-algorithm (MA) technique," as required by independent claims 17 and 18. The rejections of the independent claims under section §102 in view of Amrany are therefore believed to be improper and should be withdrawn.

Dependent Claims

Claims 2/11 and 8/15 specify a number of limitations providing additional bases for patentability. Specifically, the Examiner rejected Claims 2/11 and 8/15 under 35 U.S.C. § 102(b) as being anticipated by Amrany. Claims 2 and 11 require a lower complexity cancellation algorithm implemented by "a decision-feedback equalizer technique." Claims 8 and 15 require a reduced state sequence estimation circuit that employs a "decision-feedback sequence estimation technique."

The Examiner asserts that Amrany teaches wherein said lower complexity cancellation algorithm is a decision-feedback equalizer technique (Amrany FIG. 3: output of 546 goes into 547 and 548 and eventually is fed back to 546) and that Amrany teaches wherein RSSE is a decision-feedback sequence estimation technique (Amrany FIG. 3: element 540 which encompasses RSSE as indicated earlier has feedback).

As Applicants noted earlier, echo canceller 548 is a filter that cancels echo using the LSBs of all filter taps, and echo canceller 545 is a echo canceller that cancels echo using the MSBs of all filter taps. In any case, these elements are performing echo cancellation and not equalization (processing of ISI), and they do not use tentative decisions. In addition, see related arguments presented above.

Thus, Amrany does not disclose or suggest a lower complexity cancellation algorithm implemented by "a decision-feedback equalizer technique" as required by claims 2 and 11 and does not disclose or suggest a reduced state sequence estimation circuit that employs a "decision-feedback sequence estimation technique" as required by claims 8 and 15.

The remaining rejected dependent claims are believed allowable for at least the reasons identified above with respect to the independent claims.

The attention of the Examiner and the Appeal Board to this matter is appreciated.

Respectfully,

Kevin M. Mason

Date: June 16, 2003

Kevin M. Mason
Attorney for Applicant(s)
Reg. No. 36,597
Ryan, Mason & Lewis, LLP
1300 Post Road, Suite 205
Fairfield, CT 06824
(203) 255-6560

APPENDIX

1. A method for processing a signal received from a dispersive channel, said channel being modeled as a filter having L taps, said method comprising the steps of:

processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and

processing intersymbol interference due to more significant taps with a reduced state sequence estimation technique.

2. The method according to claim 1, wherein said lower complexity cancellation algorithm is a decision-feedback equalizer technique.

3. The method according to claim 1, wherein said lower complexity cancellation algorithm is a soft decision-feedback equalizer technique.

4. The method according to claim 1, wherein said lower complexity cancellation algorithm reduces the intersymbol interference associated with said less significant taps.

5. The method according to claim 1, wherein said more significant taps comprise taps below a tap number, U, where U is a prescribed number less than L.

6. The method according to claim 1, further comprising the step of sampling said signal.

7. The method according to claim 1, further comprising the step of digitizing said signal.

8. The method according to claim 1, wherein said reduced state sequence estimation technique is a decision-feedback sequence estimation technique.

9. The method according to claim 1, wherein said reduced state sequence estimation technique is a parallel decision-feedback equalization technique.

10. A receiver that receives a signal from a dispersive channel, said channel being modeled as a filter having L taps, comprising:

a first circuit for processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and

a reduced state sequence estimation circuit for processing intersymbol interference due to only the more significant taps.

11. The receiver according to claim 10, wherein said first circuit implements a decision-feedback equalizer technique to cancel said less significant taps using tentative decisions.

12. The receiver according to claim 10, wherein said lower complexity cancellation algorithm is a soft decision-feedback equalizer technique.

13. The receiver according to claim 10, wherein said lower complexity cancellation algorithm reduces the intersymbol interference associated with said less significant taps.

14. The receiver according to claim 10, wherein said more significant taps comprise taps below a predefined tap number, U, where U is less than L.

15. The receiver according to claim 10, wherein said reduced state sequence estimation circuit employs a decision-feedback sequence estimation technique.

16. The receiver according to claim 10, wherein said reduced state sequence estimation circuit employs a parallel decision-feedback equalization technique.

17. A method for processing a signal received from a dispersive channel, said channel being modeled as a filter having L taps, said method comprising the steps of:

processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and

processing intersymbol interference due to more significant taps with an M-algorithm technique.

18. A receiver that receives a signal from a dispersive channel, said channel being modeled as a filter having L taps, comprising:

a circuit for processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and

a sequence estimation circuit that implements an M-algorithm for processing intersymbol interference due to only the more significant taps.

19. A method for processing a signal received from a dispersive channel, said channel modeled as a filter having L taps, said method comprising the steps of:

processing intersymbol interference due to less significant taps with a first algorithm of first complexity; and

processing intersymbol interference due to more significant taps with a second algorithm of second complexity that is greater than said first complexity.

20. A receiver that receives a signal from a dispersive channel, said channel modeled as a filter having L taps, comprising:

a processing circuit that processes intersymbol interference due to less significant taps with a first algorithm of first complexity; and

a processing circuit that processes intersymbol interference due to more significant taps with a second algorithm of second complexity that is greater than said first complexity.

21. A receiver that receives a signal from a dispersive channel, said channel modeled as a filter having L taps, comprising:

means for processing intersymbol interference due to less significant taps with a first algorithm of first complexity; and

means for processing intersymbol interference due to more significant taps with a second algorithm of second complexity that is greater than said first complexity.

22. A receiver that receives a signal from a dispersive channel, said channel modeled as a filter having L taps, comprising:

means for processing intersymbol interference due to less significant taps with a lower complexity cancellation algorithm using tentative decisions; and

means for processing intersymbol interference due to more significant taps with a reduced state sequence estimation technique.